

Name: _____

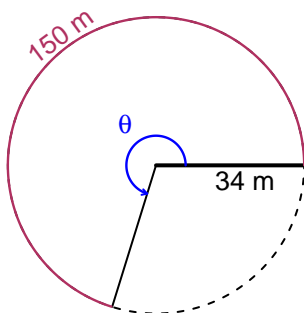
Date: _____

Trig Final (Solution v35)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 34 meters. The arc length is 150 meters. What is the angle measure in radians?

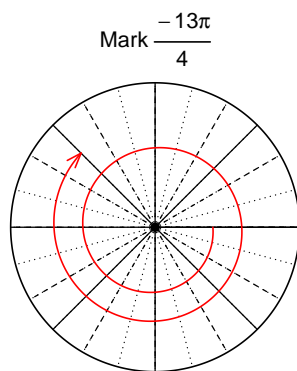


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

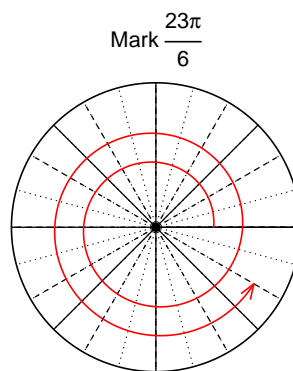
$$\theta = 4.412 \text{ radians.}$$

Question 2

Consider angles $-\frac{13\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(-\frac{13\pi}{4}\right)$ and $\sin\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).

Find $\cos(-13\pi/4)$

$$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$$

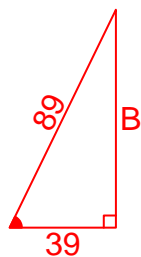
Find $\sin(23\pi/6)$

$$\sin(23\pi/6) = \frac{-1}{2}$$

Question 3

If $\cos(\theta) = \frac{39}{89}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



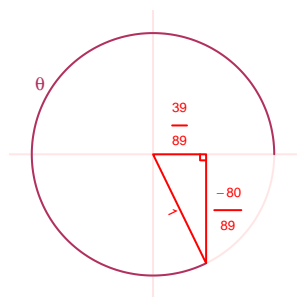
Solve the Pythagorean Equation

$$39^2 + B^2 = 89^2$$

$$B = \sqrt{89^2 - 39^2}$$

$$B = 80$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-80}{89}}{\frac{39}{89}} = \frac{-80}{39}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 7.63 meters, a midline at $y = -3.41$ meters, and a frequency of 6.47 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.63 \cos(2\pi 6.47t) - 3.41$$

or

$$y = 7.63 \cos(12.94\pi t) - 3.41$$

or

$$y = 7.63 \cos(40.65t) - 3.41$$